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MODERN BONESETTING
FOR THE
MEDICAL PROFESSION

BY

FRANK ROMER,
M.R.C.S. Eng., L.R.C.P. Lond.

Surgeon London Guarantee & Accident Co.
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INTRODUCTORY

For some years past much criticism has been published by the lay papers on the after treatment of bone and joint injuries by our profession. Owing to our neglect of the so-called art of bonesetting many such cases drift into the hands of the unqualified practitioner. About four years ago, in reply to one of these attacks, my friend Mr. Creasy and myself brought out in book form, under the title of "Bonesetting and the Treatment of Painful Joints," a series of papers which had originally appeared in the *Lancet* and *British Medical Journal.* Brief directions were given in this brochure for carrying out either by manipulation or the electric wave current, a form of treatment we had found useful in cases where recovery from the effects of injury was slow or imperfect. In the present book the treatment by manipulation, or "Bonesetting" as it is commonly termed, is alone considered, and in addition to the description of the movements, illustrations are given showing the different grips, which are identical with those employed by our unqualified rivals. At the commencement there is a short account of the history of Bonesetting, and an endeavour is made to show its influence on the medical profession with regard to their treatment of recent injuries. In submitting this book to the consideration of my professional brethren I would like to say that it is written with the object of drawing attention to a line of work, which, if the principles were more thoroughly mastered, should, from its simplicity, prove useful to those engaged in the duties of private practice.

The question occasionally arises as to the probable origin of this humble branch of surgery. Dr. Wharton

Hood, to whom the profession were originally indebted for the elucidation of the bonesetters' secrets, held the opinion that "the first bonesetter was the servant or the unqualified assistant of a surgeon who had known exactly what could be done by sudden movements and how the movements should be executed." This theory is of course possible, but Waterton, the naturalist, points out that this "art" is practised not only in England but throughout Europe as well, and that in Spain he bears "the significant name of Algebusta." Personally, I believe that some such rough and ready method of treatment has always existed, but that its utility got overlooked during the time surgery was developing into a definite science. As our professional ancestors progressed in their knowledge of pathology, such a condition as tubercular disease began to be more generally understood, and the importance of quietude in this and other acutely inflamed joints was soon realized. In consequence of the general appreciation of the value of absolute physiological rest in these cases, it was not long before it was considered essential for the treatment of all painful and swollen joints, no matter from what cause. The cult of complete rest became to be deemed so necessary that it was never considered advisable to use a joint as long as the least pain was experienced on attempted movement, thereby reminding one of the boy who was forbidden to enter the water till he had learned to swim.

The universal adoption of these principles by the profession caused anything in the way of more vigorous treatment of injuries to remain in the hands of the less educated classes, who, rushing in "where angels fear to tread," frequently obtained brilliant results from their unorthodox methods. Thus it happened that many of the vendors of herbs and simples resident in country places came to specialize in this business, which, unlike the majority of folk lore remedies, contained, in the words of the *Lancet*, "some long forgotten truth." Mr.

Bennett, a well-known bonesetter from the Midlands, wrote a book in 1880, to which I am indebted for some interesting historical information. Unfortunately, beyond acquiescing in the correctness of the movements detailed by Dr. Wharton Hood, he gives no hints as to his own procedure. He does, however, lay claim to treating recent dislocations and fractures as well as the old-standing cases of impaired limbs. As far as I can find out no other bonesetter has ever committed his methods and experiences to paper, though I understand that in America certain books are published on Osteopathy, which is apparently a glorified form of the old-fashioned bonesetting. The methods employed by Hutton were fully explained by Dr. Wharton Hood in his book, and though those I am about to describe are practically the same there is occasionally some deviation ; attention is also drawn to the particulars of the after treatment, which is most important in cases treated in this way. There is still something to be gleaned from the procedure of the modern Huttons in spite of our increased knowledge of the subject, and I counsel my profession to bear in mind to-day the advice given by Sir James Paget many years ago, "to copy what is good in the practice of bonesetters." During my student days, though we were taught the pathology of adhesions and the possibility of their appearance in joints after injury, beyond the fact that the ensuing disability could be remedied by "breaking down," no instruction or information was vouchsafed as to the best way for setting about the act. Dr. Wharton Hood, to whom I am ever under a great debt of gratitude for many acts of kindness, first showed me what good results could be obtained by forcible movements skilfully applied in suitable cases.

Well known authorities in orthopædic surgery, such as Mr. Howard Marsh and Mr. Tubby, have described the procedure to be followed when dealing with cases in which treatment by *brisement forcé* is considered desirable. Mr. Tubby, when describing contractures

and ankylosis in his book on "Deformities, a treatise on Orthopædic Surgery," says that in regard to the prognosis of such conditions :—"This may be best determined in the case of fibrous ankylosis by an examination under an anæsthetic. If, with the employment of very slight force, the adhesions readily give way, and but little heat, pain or swelling follow, then a good result may be looked for when passive motion, douching and massage are persevered with. But it is not the remotest use breaking down adhesions once and then sending the patient away. Passive motion must be employed within a day or two of the operation and steadily continued ; thus only can a successful result be obtained."

Continuing, he finds that "preliminary tenotomy and fasciotomy are often of service." It might be assumed from these words that forcible manipulation was only really necessary in the more obvious and severe cases of ankylosed joints, and yet Mr. Tubby remarks :—"In many instances some amount of fibrous ankylosis is due to unwillingness on the part of the patient to move the joint after a slight attack of synovitis, or to want of firmness on the part of the medical attendant in insisting on the patient so doing. Particularly is this the case in some cases of severe sprain and in inflammation of a joint associated with fracture in the neighbourhood. Such cases drift about until they fall into the hands of the bonesetter, who, with one jerk, relieves the patient of his or her disability and arrogates to himself the credit of 'putting in a dislocated bone.'"

The advisability of the medical man in charge of such patients performing this small operation himself is not, however, suggested. The number of patients suffering in the way just described, who attend the consulting rooms of the unqualified practitioners, is far greater than is generally supposed, and the incomes earned in consequence by some of the London bonesetters would be a revelation to the medical profession. One of the

best known amongst them informed me that he was occupied all day, and every day, treating the various forms of defective joints. It is obvious, therefore, that our profession are, to a certain extent, either chary of trying this simple form of treatment for themselves, or are ignorant of the benefit to be obtained by its adoption, especially in those vague conditions of impaired mobility where the patient complains more of a deviation from the normal than of anything markedly defective. Granted, that certain of these cases are quite trivially affected and might almost come under the heading of hysterical joints, yet, if free movement under an anæsthetic affords the welcome relief, either by suggestion or the freeing of some small adhesions, the result is beneficial, and such treatment is worthy of more attention than it at present receives. In describing, therefore, the different manipulations suitable for joints where marked impairment is present, attention is drawn to the slighter disabilities capable of being cured by the same means, and in which the bonesetter of to-day specializes.

Contrary to the popular belief that some mysterious gift is essential for the successful performance of these manipulations, there is nothing to prevent any practitioner doing them with success, provided that care is taken to ascertain the particular lesion that exists. A certain delicacy of touch is doubtlessly requisite to properly appreciate that lesion, whilst the correction largely depends on knack, but both can easily be acquired by experience and practice.

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CHAPTER I

HISTORY OF BONESETTING

The general public have always shewn themselves greatly interested in the cures achieved by the so-called art of bonesetting as practised by its exponents. Doubtless this is in some measure due to an inherent belief in all "occult" methods of treatment, together with the mistaken notion that only certain individuals are endowed with some peculiar gift of healing by manipulation. At the same time credibility alone would not be sufficient to keep interest alive, were it not founded on something more definite; and it must be granted that treatment at the hands of unqualified practitioners often brings about quick and permanent cure, even in cases where the highest surgical skill has been sought in vain.

That well-known surgeon, the late Sir James Paget, in a lecture delivered by him at St. Bartholomew's Hospital, made the following observation:— "Few of you are likely to practise without having a bonesetter for an enemy, and if he can cure a case which you have failed to cure, his fortune may be made and yours marred." These words I

venture to say are as true to-day as they were some forty odd years ago. In spite of our increased knowledge in what the *Lancet* once termed "that long neglected corner of the domain of surgery," modern professors of bonesetting are doing as much to lower the reputation of the present generation of medical men in the eyes of the public as their prototypes, made famous by Hutton, managed to do to their fathers before them, in regard to the treatment of injured joints.

Though this statement may possibly give rise to difference of opinion, yet judging from the letters in the public press that periodically appear in the ever recurring controversy on bonesetting, as well as my own experience in the subject, I am convinced that the medical practitioner pays but scant heed to this particular branch of work, and is, with but few exceptions, quite uninformed as to the class of case suitable for treatment by manipulation or to the methods best adapted for the purpose. The reason that such a condition of affairs should exist bears this explanation. The modern treatment of bone and bone joint injuries by means of massage, radiant heat or electricity, in the place of the absolute and physiological rest formerly deemed essential, has made it comparatively rare to find a joint entirely incapacitated by fibrous adhesions.

In certain cases, such as fracture in close proximity to a joint, this condition of complete ankylosis

may and does sometimes occur, but being readily recognized, the surgeon would speedily rectify the loss of mobility before relinquishing attendance. In truth most medical men understand and successfully deal with the grosser lesions caused by adhesions, but it is particularly in the smaller defects that their observation fails. Just as the majority of surgeons fifty years ago closed their eyes to the lessons being taught by Hutton, Matthews, Mason and a host of less well known bonesetters who were competently and constantly treating the old-fashioned rigid joint, so the modern practitioner is apt to look askance at the work of the present day bonesetter, who has adapted his treatment to the conditions existing where the utility of a joint is slightly impaired by some defect which though not sufficient to cause complete lack of movement yet is capable of being both irksome and painful. The old idea, that these cures wrought by bonesetters are brought about by the reduction of an overlooked dislocation, still holds good in the public mind. This historical diagnosis of "Bone out" may be accounted for by the fact that these men, being for the most part totally ignorant of the true nature of the lesion, were misled by the crack of the rupturing adhesions, and, finding that improved mobility followed their ministrations, were honestly convinced that a bone had been restored to its place. Many of the bone-

setting fraternity still adhere to this popular error, though it is but fair to add that the best known of them holds no such mistaken view.

Survival of this incorrect diagnosis has, I believe, done much to prevent medical men enquiring more fully into the meaning of these present day cures. Satisfied that no marked ankylosis or anatomical displacement existed in some case treated successfully by modern bonesetting, they are inclined to dismiss further discussion of the question. On the assumption that the result has probably been achieved by suggestion, no attempt is made to connect it with the modern aspect of old-fashioned bonesetting of which they are already well informed. All the same, from the patient's point of view accurate diagnosis is not nearly so important as successful treatment. It is only human that the lay mind should prefer to accept the opinion of the man who erroneously states a "bone is out," and then works a speedy cure, in preference to believing the doctor who correctly maintains there is nothing anatomically wrong but can offer no other advice than that time will probably bring about recovery.

Doubtless most medical men have themselves at some time or other either seen or are aware of instances where considerable damage and even fatal results have followed the manipulation of joints unsuited for such treatment. That these

unfortunate accidents have occurred is only too true, but it would be a mistake to condemn all treatment by bonesetting on this account. Such errors would rarely, if ever, be occasioned, were medical men, with their skilled training and the advantages offered nowadays to diagnosis by radiography, to take the trouble to acquire the technique of bonesetting. They would thus enable themselves by its means to undertake the treatment of those cases which still continue to stray into unqualified hands.

A greater understanding of this much misunderstood line of work would, I am convinced, prove of the utmost value in two ways: to the public at large by protecting them from the risk of faulty diagnosis and to the medical profession itself by removing the reproach of indifference, which is so constantly, and I fear not unjustly, made with regard to their treatment of joints whose recovery from injury is unduly delayed.

In all probability, not only in England but practically all over the world, the method of treating injured limbs by what is called bonesetting has always been in existence. In some country districts the same family for many generations past has had one of its members carrying on the trade of bonesetter. The different movements and methods of procedure were treated as business secrets, and handed down from father to son or some other near relative

who might show aptitude or desire to take up the calling. Nearly all the present day bonesetters can trace a relationship to a former exponent of the art, and in many cases have made considerable advance in their knowledge of the treatment their forefathers taught. Apart from the fact that these men looked upon their knowledge as a secret to be jealously guarded from any enquiries, they were usually drawn from the humbler and less educated classes, hence, until the publication of some papers "On Bonesetting—So called," by Dr. Wharton Hood, in 1871, no literature existed on the subject. In 1665 we find that a man named Turner published a book entitled the "Compleat Bonesetter," but beyond quaint descriptions of certain fractures no information regarding manipulative treatment is given. References in the public press, however, were not uncommon, and the *London Magazine*, in 1736, brings into considerable prominence the claims of a certain Mrs. Mapp, who lived at Epsom. She was the daughter of a Wiltshire bonesetter and speedily made a great name for herself, not only at Epsom but in London itself. So famous did she become that a play was acted at Lincoln's Inn Fields entitled "The Husband's Relief or the Female Bonesetter and the Worm Doctor," in which reference is made to her as the "doctress of Epsom." Scattered through the various periodicals and magazines, letters and articles were constantly

appearing in which attention was drawn to the recoveries brought about by the bonesetter, and to the inability of the medical profession either to understand or explain the meaning of such cures. The numerous writers of letters to the newspapers of to-day on this same subject need not, therefore, imagine they are propounding a novelty, for it would appear bonesetting has always been a fruitful source of copy to journalism. Some of these written experiences, though lengthy, make interesting reading enough; one cannot be surprised, though, that the medical profession failed to arrive at the truth of the bonesetting question, concealed as it was in the mass of verbosity and irrelevant detail the writers adopted when describing their cases.

Curiously enough the word "bonesetter" has no connection with the surgical skill necessary to obtain good position in fractured bones. The origin of the word is hard to find, but its practice has been known from time immemorial. Dr. Wharton Hood defines it "as the art of overcoming, by sudden flexion or extension, any impediment to the free motion of joints that may be left behind after the subsidence of the early symptoms of disease or injury." It was in 1871, as I have mentioned, that Dr. Wharton Hood published in the *Lancet* a series of papers describing, from personal observation, the methods used by Hutton, a

bonesetter of world-wide reputation. For the first time the real meaning of these mysterious movements referred to by so many patients was made clear to the medical profession. The question of bonesetting at once received considerable attention in medical circles. Papers were read at various meetings on the subject, when it received full discussion.

Dr. Bruce Clarke was amongst the first to describe, from the dissection on the joints of amputated limbs, the real nature of the adhesions which caused the disability capable of being cured by free movements. In the course of his lecture he advised surgeons to consider seriously the question as to whether prolonged rest in all cases of injury was absolutely necessary, since it undoubtedly was the cause of these adventitious bands being formed. Some years previously Sir James Paget, in a lecture, "Cases which Bonesetters Cure," had given similar advice by saying, "Sprains may often be quickly cured, freed from pain and restored to useful power by gradually increased violence of rubbing and moving." Dr. Dacre Fox, of Manchester, about the same time contributed an interesting article pointing out that the bonesetters in the North did not entirely confine their work to the treatment of old injuries, but were constantly employed by their clients for recent sprains and dislocations, which they treated with marked success.

In fact it would appear that these men, though possessing no training in surgical or anatomical knowledge, were in the habit of moving and rubbing recent injuries long before early movement and massage was deemed a correct method of treatment by the medical profession. An old time Lancashire bonesetter, on being questioned as to his reasons for treating sprains in this way, replied, "What has been caused by violence must be cured by violence." From this epigramatic remark one might almost define bonesetting as being the homœopathy of surgery, since "similia similibus curantur," best describes its methods.

The movements adopted were not, as some imagine, merely haphazard in direction and amount of violence: whether employed for breaking down adhesions, moving sprained joints or reducing dislocations, they were the outcome of a certain knowledge. This knowledge, combined with constant practice, observation and experience, made the bonesetters conversant with the situations where adhesions were most commonly found in the different joints, and I think it quite feasible that, besides the carefully studied movements used by them for breaking down adhesions, they employed routine manipulations for reducing the various dislocations, much on the same lines that Kocher describes in his method for the reduction of a dislocated humerus.

Dr. Wharton Hood, Howard Marsh and others, however, consider that any successful treatment of dislocations at the hands of these men was merely a matter of luck. On the other hand, Dr. Schivardi, of Milan, in 1871 asserted that a woman named Regina dal Cin, a well known bonesetter of Trieste, not only broke down adhesions by methods similar to those employed by Hutton, but successfully reduced dislocations as well, some being of long standing. She, it may be of interest to note, was the daughter of a bonesetter, and at one time received permission to practice at Vienna, though the permit was eventually withdrawn. From this time onward the medical profession recognized the benefits to be derived from the hitherto despised practice of bonesetting. Not only did they adopt similar methods for the correction of joints ankylosed by fibrous adhesions, but by modifying the period of complete rest in sprains and fractures they lessened the chances of such a condition arising. Gradually the employment of massage, heat and electricity became to be more generally accepted in this class of injury, till nowadays it is almost universally advised as affording the best results. The adoption of this more active mode of treating injuries has had the curious effect of reviving the cult of the bonesetter. This recrudescence may he attributed to the following causes. In consequence of these modern methods, prac-

titioners have had less necessity or opportunity for breaking down adhesions, and, it would seem, have apparently forgotten that "bonesetting" might occasionally prove a valuable adjunct to treatment. In addition, relying too much on passive movements and the endeavours of the masseur to prevent the formation of adhesions, they are nowadays too apt to prescribe prolonged massage for the relief of joints where recovery from the results of trauma is unduly delayed. Though it is quite possible that perseverance in such treatment would bring about the desired effect, yet patients are often inclined to grudge the time and expense it entails, the result being that many of them seek and find relief at the hands of the unqualified bonesetter, who is once more enabled to flourish in our midst.

CHAPTER II

PRINCIPLES OF BONESETTING

The question as to what cases are suitable for treatment by manipulation depends to a large extent on the length of time which has elapsed since the injury was originally sustained, for though the joint impaired by such conditions as rheumatism, the so-called rheumatoid arthritis, or gonorrhœal infection may sometimes be benefited by similar methods, yet undoubtedly it is where recovery from the effects of trauma is slow that forcible movement gives the best results. No useful object will be served by describing the pathology of the various ankyloses, and for the purpose of this book it may be assumed that reference is made to fibrous adhesions caused mainly by trauma, though certain cases may be included where ankylosis has been caused through other conditions.

Again, though treatment by bonesetting is usually rapid and effective, it must be remembered that a cure could in many cases be achieved by electricity, prolonged massage or other means. In certain persons perfect recovery from the effects of some apparently trivial sprain is always prolonged, even

though a course of treatment has been adopted identical in all respects to what has ordinarily been found sufficient to effect speedy recovery in more normal patients. For this reason it is impossible to give any definite time as to when it is desirable to interfere, but it is seldom, save in certain cases, necessary to do so till some four or five weeks after the receipt of injury. I have found adhesions make their appearance in a joint as early as three weeks after the receipt of an injury. Their capability of interfering with the action of a joint depends to a large extent on their situation. They may exist within the joint itself, binding together the articular surfaces and folds of the synovial membranes or be entirely periarticular, when the surrounding tendons have become adherent to their sheaths through teno-synovitis. The resulting disability may vary from complete ankylosis of the joint to a condition where pain is only elicited by some particular movement. An important point to bear in mind is that a joint need not be entirely incapacitated by adhesions to be benefited by manipulations. As I have said before, complete ankylosis is rare compared to what it was in the time when absolute rest was considered essential in the treatment of bone and joint injuries. Hence it frequently happens that the possibility of some small adventitious band is not suspected, provided the joint moves with comparative freedom. Though doubt-

less all medical men are fully aware of the effect of adhesions on a joint, and the methods of dealing with them, nevertheless bonesetters are still able to gain kudos in cases in which some minor disability follows the orthodox treatment. The class of defective joints most commonly met with as being suitable for this treatment are :—

1. Joints which have become weak and stiff from sprains.
2. Joints adjacent to the seat of a fracture, rendered stiff and useless from enforced rest.
3. Cases where bones entering into the formation of a joint have sustained injury, though the amount of disability caused by alteration in the position of the bones may accentuate the loss of the full range of movement.
4. Those stiff from disease, such as rheumatism or rheumatoid arthritis.

Nowadays, though the cold, œdematous appearance of a joint incapacitated in this manner is no longer so marked, the situations where the adhesions form and the pain is experienced are practically the same, and I cannot do better than enumerate the usual sites of these painful spots, as pointed out by Dr. Wharton Hood and Dr. Dacre Fox :—

1. Over the head of the femur in the centre of the groin, corresponding to the ilio femoral band of the capsular ligament.
2. For the knee joint, at the back of the lower edge of the internal condyle. In other words at the posterior border of the interior lateral ligament, where the semi-membranosus tendon is in intimate relation with it. This part suffers most

because a sprained knee is almost always caused by the joint yielding on the inner aspect.

3. In the shoulder, at the point corresponding to the bicipital groove, the posterior and inferior folds of the capsular ligament and the side of the joint corresponding to the bursa of the deltoid, which sometimes becomes adhesive through inflammation of the surrounding tissues.
4. The elbow: the front of the tip of the internal condyle. The fan-shaped internal lateral ligament has its apex at that point, and it is most stretched in over-supination, with extreme extension of the forearm.

On the front of the external malleolus, the apex of the plantar arch, the tip of the fifth metatarsal bone, the styloid process of the ulna, the inside of the thumb and the annular ligament in the front of the wrist, are respectively the most painful spots when those joints are severely sprained.

In addition to joints being affected by adhesions, muscles and tendons are often similarly incapacitated, most commonly in such regions as the adductor muscle of the thigh, which are often found contracted and stiff in cases of chronic rider's sprain; the muscles of the forearm, especially the supinator longus, and extensors of the wrist from a condition of chronic tennis elbow; the muscles of the calf and tendo-achillis from neglected tennis calf. Careful examination in such cases will reveal a painful, though comparatively slight, interference with the normal range of movement, to cure which forcible manipulation will be often just as necessary

as in joints whose action is entirely crippled by adhesions. Some authorities state that previous to attempting these operations on ankylosed joints careful preparation for a week beforehand by hot fomentations and massage is essential. These preliminaries, though originally employed by older bonesetters, are not now needful, though perhaps in certain cases of long standing, where the whole limb is stiff from disease, a few radiant heat baths, combined with massage, might prove useful by rendering the muscles more supple. Again, it has been suggested that in such circumstances tenotomy should be previously performed, but in the majority of cases nowadays proper attention to the after treatment makes this a quite unnecessary procedure.

Unless contra-indicated, when adhesions are to be broken down an anæsthetic must always be given, not so much for the avoidance of pain as to ensure complete relaxation of the muscles. By dispensing with an anæsthetic the difficulties of the operation are increased, as it will be necessary to overcome muscles which the patient will involuntarily put into action for the protection of the joint before the adhesions can be satisfactorily ruptured. At the same time a risk is run of severely straining or rupturing the contracted muscles.

Since it does not produce sufficient muscular relaxation nitrous oxide gas should not be

selected as the anæsthetic, and it is possible that where severe inflammation has followed forcible movements in suitable cases these points have not been observed. Where manipulation has been properly performed no untoward result need be feared, as there is nothing in the rupture of fibrous bands to cause inflammatory action, provided the case is otherwise suitable.

In the description given by Dr. Wharton Hood of Hutton's methods no mention is made of anæsthetics; he says, "the resistance of the muscles is overcome, or, at least, reduced to a minimum, by rotating the limb as much as possible on its axis. In this way the muscles are thrown out of their ordinary lines of action and are rendered almost powerless." By this rotation, muscular resistance was evaded, and, as Hutton was wont to say, "Pulling is of little use; the twist is the thing."

The principles by which the operator should be guided when undertaking the breaking down of adhesions, are, to obtain sufficient firmness of grasp, sufficient leverage to apply the necessary force, and to apply it in the first instance in the opposite direction to which movement is defective; that is to say, the extension being painful and defective the first movements should be in the direction of flexion. Generally speaking, the movements should be performed in a swift, even and firm manner, so that a joint undergoes the motions of its normal

action, though not necessarily to the full extent of its range. The reason of this is that the muscles will have contracted in proportion to the limitation of movement permitted by the adhesions, and once that limitation has been overcome the contraction of the muscles will be the only impediment to the normal range. The adhesions once ruptured after treatment will speedily restore the elasticity of the muscles, which might well be strained should the full extent of movement be at once sought.

In cases of long standing the adhesions yield with a distinct, audible snap or crackle ; others of less duration with the noise of tearing parchment, whilst those of still more recent date, though giving no audible sound, can generally be felt by the fingers of the operator. Experience shows that rapidity in the execution of the movements gives rise to far less after-pain than if the adhesions are broken down by slow and deliberate stretching, but care must be exercised against jerks or undue violence. When taking hold of a limb the grasp should be just above and just below the affected joint, for though a more powerful leverage could be obtained by more distant grips, yet it is as well to bear in mind that other structures may be broken besides adhesions, whilst in the young there is danger of separating the epiphysis. Formerly, in the pre-anæsthetic days, the use of the long leverage was employed, but now muscles can be so

easily relaxed by anæsthesia it is safer to act as described.

After-pain is certain to be present in varying degrees, but will pass off in the course of an hour or so, and provided sufficient care has been taken in the operation no apprehension need be felt on this point. Within a few hours the joint should be gently massaged and movements aided. On commencement the massage must be of the lightest description and should consist of gentle, stroking movements in the direction of the trunk. As the pain subsides, the rubbing may be of a more vigorous character and voluntary movements of the limb aided and encouraged, but all semblance of roughness must be avoided. The rubbing should last about twenty minutes to half an hour. The mere allowing a joint to remain quiescent for forty-eight hours, as is sometimes recommended, is not safe; sufficient time may then be given to allow the freshly ruptured adhesions to re-unite. Notwithstanding the pain, every effort should be made to keep the joint free, and on no account should any bandage or splint be applied. It will be found that the rubbing, if skilfully performed, gives great relief from the pain, and local application is scarcely ever required.

In patients who show great intolerance to the least discomfort or pain, dry heat by means of hot salt bags and the administration of a few grains of

aspirin usually afford relief. Occasionally full movement and freedom from pain follow the manipulations, but this ideal result is rare; more often a patient is quite unable to move the joint beyond the extent obtained under the anæsthetic, though a sense of greater freedom is usually experienced, the explanation being that though there is no longer mechanical obstruction in the joint, the muscles, from disuse, are so wasted and contracted that they are physically incapable of normal work. To dismiss a patient without correcting this condition is to court almost certain failure. Simply to order the joint to be used is for the most part useless, as few people have the strength of will necessary to make muscles perform their proper functions at the expense of pain.

It is the custom of a large number of bonesetters to administer an anæsthetic, on two or three subsequent occasions, for the purpose of overcoming the muscular resistance. This should never really be necessary if the adhesions have been properly dealt with at the time of the operation, and the most satisfactory treatment after the first two days consists in substituting for the rubbing graduated exercises, by means of weights and pulleys. These exercises, though possibly painful, must be performed daily, when it will be found that an increase of strength and mobility bring decrease of pain. Exercises should be diligently persevered

in till the muscles have regained their former bulk and the joint its full power of movement. Such are the broad principles upon which bonesetting is based, and though in certain particulars the procedure which is set out differs from that advised by some surgeons, it embodies the experience gained in a large number of cases in which success has followed its adoption.

Before describing the various movements which will be required for each joint it may be as well to emphasize some of the more important points to be observed in their performance.

In the first place, an anæsthetic should always be employed, even for the apparently trivial cases, as apart from the chance of meeting with undue muscular resistance the pain experienced by the patient is sometimes out of all proportion to the amout of disability present.

Secondly, the movements should be executed in a quick, smooth manner, avoiding all jerks and undue violence.

Thirdly, in seizing the limb a short leverage should be taken for fear of fracture. Once the adhesions have ruptured full movement of the joint must not be sought for fear of over-straining the contracted muscles. In all cases in which diagnosis is doubtful it is advisable to obtain a radiograph, in order that any morbid condition may be excluded.

CHAPTER III

MANIPULATIONS

When a patient seeks advice concerning a joint which continues to be painful on use in spite of the usual remedies, many weeks after the receipt of an injury, the possible presence of some adhesions should be considered. Enquiry should be made as to whether the original hurt affected the joint sufficiently to cause acute synovitis, or if the structures in its immediate neighbourhood were alone implicated. In the former, any impeding bands of adhesions are probably connected with the synovial membrane, in addition to which, in middle-aged people, it is possible some arthritic changes of the bones may be developing. In such cases a radiograph is desirable, which would demonstrate these changes, if existing, and though the presence of such a condition does not preclude improvement by manipulation, yet it is as well to give a guarded prognosis as to complete recovery. Should the stiffness and pain exist where there has been no inflammation of the joint, but which remains impaired through the rest necessitated for either fracture of the bones or injury to the adjacent

soft parts, the adhesions are nearly always peri-articular, or connected with the tendons, and here forcible movements give excellent results. In the majority of these cases the pain complained of is only experienced on attempting to use the joint normally, and it is sometimes difficult to get patients to understand that an active condition of injury, necessitating continued care, no longer exists, or realize that the case has gradually merged into one where a more strenuous line of treatment is essential to complete recovery. Some people are so intolerant of pain in any form that they exaggerate discomfort into pain, and pain into agony, and this type of patient is apt to resent any treatment which entails endurance or discomfort. On the other hand, I once saw a man who for five days had been going about with a complete fracture of the shaft of the ulna, who only took advice because of the "funny feeling" experienced, so that, diagnostically speaking, the degree of pain felt is but a small criterion of gravity.

Where, however, pain is constant and independent of movement, it is unwise to interfere without the greatest care being previously taken to eliminate anything of a serious nature. Questions should be asked with a view to determining, if possible, the exact situation of the pain, and in a large number of cases this will be found to correspond with those described by Hood and Dacre Fox; these spots,

moreover, are occasionally tender on pressure. The corresponding joint on the sound side should be examined at the same time, careful comparison made of the difference in the range of movement, and to what extent movement can be performed before pain is elicited. The condition and tone of the muscles should be also observed, since a difference between the opposite sides will usually necessitate more lengthy attention to the after treatment. Generally speaking, where the muscles on the affected sides are stiff and rigid in addition to being wasted, it is advisable that the rubbing, which ordinarily will be found only necessary for a period of four or five days, be continued in conjunction with exercises for another ten days or longer.

The Shoulder Joint

The shoulder, from its great liability to injuries, is perhaps the joint most commonly incapacitated by adhesions. It is for this reason that the manipulations necessary for its restoration are first described.

This joint, being capable of a very wide and varied range of movement, a slight impairment of one of them is liable to follow any injury to that region. Apart from the disability following the more serious accidents, such as dislocations or fractures, adhesions follow a variety of quite trivial mishaps, which at the time have not been considered

sufficiently serious to need the services of a medical man. Amongst them that of "throwing the arm out" is a very common cause in men past middle age. Having thrown some light object, such as a stone or a tennis ball, they have at once experienced a sickening pain in the shoulder, and, though the acuteness passes off within a few minutes, it sometimes happens that they never quite recover full power in the arm, or lose a tendency to a sharp pain on certain movements. This delay in recovery is due to some adventitious band, usually connected with the biceps tendon, and recovery will not be complete until this impediment has been remedied.

Another quite common accident, setting up a similar condition, is caused by jumping off a moving vehicle, such as an omnibus, with the hand still holding the rail; habitually over-swinging at golf with a club too heavy for proper control, over-hand serving with a heavy racquet at tennis, however, and the irritation caused to a joint by the vibration of the handles of a bicycle, which were grasped too tightly by a beginner, are amongst the rarer causes met.

Although complete ankylosis is rare, adhesions in and around this joint often exist, causing considerable loss of movement, which to a certain extent may be masked by the apparent freedom allowed by the scapula. Therefore, when examining

a shoulder in which adhesions are suspected, the scapula should always be fixed by the hand whilst the movements are tested. When the mobility of the shoulder joint is impaired by adhesions the arm is carried in a stiff, unnatural manner, and though antero-posterior movements may be fairly free, any attempt to raise the arm above the level of the joint causes the whole shoulder to go up until the rotation of the scapula has reached its limit.

Placing the hand behind the back, in such an action as buttoning the braces, or that curious shrug of the shoulder entailed in the putting on or taking off a coat, are other motions usually found defective. Provided no movement of the joint is made which pulls on the adhesions, pain is not as a rule a marked symptom. At night, however, this is the reverse, and the patient usually complains of being wakened at intervals by a considerable amount of pain, which is frequently attributed to rheumatism. The explanation is that during the day time any movement likely to cause pain is prevented by the contraction of the controlling muscles, but as soon as sleep supervenes these muscles gradually relax till the steady drag of the limb on the adhesions sets up a sufficient amount of pain to arouse consciousness. In all cases in which there is much disability adhesions will be mainly found in the posterior and inferior folds of

the capsular ligament and will account for the loss of the movements mentioned.

In those vague conditions in which complaint is made of occasional very acute pain in the front of the shoulder, caused through some particular motion, but in which no marked loss of mobility is found, small adhesions frequently exist in the tendon sheath of the long head of the biceps where it dips into the joint.

Again, where abduction is found to be slightly defective a pain is experienced on the outer side of the joint, the bursa of the deltoid has sometimes become adherent, through inflammation, to the surrounding tissues. In such circumstances as these manipulation will afford a speedy and effective cure.

The patient should lie on a bed or couch with the affected limb freed of clothing. Anæsthesia having been established, the method of procedure in the case of a right shoulder is as follows :—

The operator grasps the elbow joint with his right hand, whilst his left steadies the shoulder. He then quickly rotates the head of the humerus till it is felt by the left hand to be moving freely. Sliding his right hand up, he seizes the arm close up to the joint and carries the limb across the chest till the limb reaches the middle line, where he again quickly rotates and then brings it back to its former position. With the left hand still steadying the shoulder, the arm is made to move in gradually

increasing circles, till any adhesions are felt to yield. The patient is then half turned over, and the arm and hand made to go behind the back, the thumb of the operator being firmly pressed over the bicipital groove in order to prevent any possible movement of the sheath interfering with the rupture of the adhesions which impede free play of the tendon. The arm must now be abducted firmly with the external condyle uppermost, whilst the operator's left hand pushes against and resists rotation of the scapula until the adhesions yield with their characteristic tear; the arm should then be quickly rotated outwards and carried upwards and to the front. These movements, if properly carried out, are sufficient to rupture any adhesions that may exist in or around the joint, and, provided no undue violence has been used, no inflammation will ensue. Pain, however, will be present to a certain extent, but even when severe no apprehensions need be felt. Within an hour or so of the operation the shoulder should be gently rubbed and moved; this, if carefully performed, will greatly relieve the pain, and rarely will any local application be necessary. Rubbing and movements must be continued daily, and on no account should the arm be slung or kept immobile. Within a few days exercises, preferably by means of weights and pulleys, should be commenced, to restore the inevitably wasted and contracted muscles.

The Elbow Joint

Even comparatively trivial injuries of the elbow are liable to be followed by impairment of the normal ability. In a large number of cases, where a too prolonged use of the sling has been permitted, though a certain amount of flexion and extension is painlessly and easily performed, anything like free use of the joint is prevented by the obstruction of the biceps and triceps muscles. Indeed, the limitation of the movement allowed by this contraction is often so restricted that till it is overcome the additional presence of adhesions is not always easy of diagnosis. Even when adhesions are the principal cause of the stiffness, pain on use is not a marked symptom, unless the joint be suddenly moved beyond the limits of its existing range. In cases where recovery is slow, by the more ordinary means of treatment, soundness is undoubtedly hastened by manipulating the joint and carefully stretching the contracted muscles. Occasionally the full range of movement can be obtained immediately anæsthesia is established; but more often, apart from the presence of adhesions, a considerable amount of muscular resistance is experienced, especially if the case be of long standing.

The hands should grasp the limb just above and below the joint when effecting the necessary movements, care being taken to keep the thumb of the

lower hand firmly pressed over the head of the radius during the extension of the joint, lest the pull of the contracted biceps cause dislocation of that bone. Rotatory movements of the forearm must first of all be made, followed by a rocking of the joints backwards and forwards, the first motion of which should be in the direction of the least resistance; that is to say, if flexion is the more defective movement the elbow should be extended, and then flexed carefully, increasing the range on the principle of a swinging pendulum. When mobility of the joint is fairly free, the muscles should be carefully stretched. This can be best accomplished by a series of intermittent jerks, and the muscles appear to yield more readily than if they are stretched by continuous pressure or strain. Should there have been any interference with the proper performance of pronation or supination, the forearm must be briskly put through its movements. In certain cases of chronic tennis elbow, where the muscles at fault are found to be rigid, manipulation is often of the greatest value. Before going through the movements already detailed, the affected muscles should receive special attention.

The best way of restoring the suppleness is to grasp a few inches of the muscle between the fingers and thumbs of both hands, and moving the muscle laterally between the fingers knead it gradually through its whole length. After acting in

this way flex the wrist to put the extensors on the stretch and then straighten the elbow joint.

As in former cases, rubbing and exercises will complete the cure.

The Knee Joint

The medical profession fully appreciates the value of early movement and massage in the treatment of acute traumatic synovitis, but in spite of the adoption of modern methods, small adhesions are formed in this joint more generally than is usually suspected, and it is especially with regard to these indefinitely crippled limbs that the modern bonesetter gains such success.

The treatment and cure of the acute condition should not be the only aim of the practitioner. The invariably wasted muscles and occasionally painful joint rendered by the more immediate effects of injury should not be left for time to cure, but efforts should be made by means of suitable exercises and electrical treatment to bring about perfect soundness before dismissing the patient. Where there is no evidence of disease or any internal derangement of the knee joint, but where, in spite of treatment, certain movements continue to be painful or defective, the possibility of adhesions should be considered. In the more severe cases, where any useful movement of the joint has been lost, adhesions are easily recognizable, but in

certain conditions where there may be merely a painful interference with the play of full extension or full flexion, their presence is liable to be overlooked.

It will be found that these lesions usually occur when the synovitis has been due to a strain of the joint, in contra-distinction to that resulting from direct injury, and it may be assumed, therefore, that the adhesions are connected with the tendons controlling the joint. Again, the pain is more usually noticed on the inner side of the joint; the structures in that region being more liable to injury from the tendency of a straining joint to yield on the inner aspect, adhesions are likely to form there.

The manipulations necessary for the correction of such disability are as follows :—

The patient being duly anæsthetized should be so placed that the affected limb extends over the edge of the bed, as far as the popliteal space. The operator should then grasp the patient's foot between his thighs and with his hands rock the patella from side to side, to free it from any possible adhesions, and no attempt at flexion of the joint should be made till this be found to be moving freely. Cases have occurred in which fracture of the patella has resulted owing to the neglect of this important point. The operator now bends his knees, whilst his hands acting as a fulcrum firmly grasp the shaft of the tibia close up to the joint.

By this means the force necessary to bend the knee and rupture the adhesions can be regulated and the muscular resistance appreciated. No attempt should be made to obtain full flexion immediately, but by alternately bending and straightening the knees free movement of the joint will gradually follow. The amount of resistance offered by the contracted extensor femoris should be the guide as to how far it will be permissible to continue flexion, and care must be exercised to avoid rupturing or spraining this muscle. Once the adhesions have been ruptured, after treatment will restore the remaining degrees of flexion. The operator should next make a quick but not violent rotatory movement of the tibia, whilst his thumbs are firmly pressed against the sides of the joint. In those cases in which adhesions are preventing the full extension of the joint, but where flexion is normal, a similar grasp should be employed, the only difference being that the force will be applied by straightening the knees and pushing the hands against the joint.

Besides manipulating in this manner for the rupture of some small impeding adhesions, the unqualified practitioner is particularly successful in certain cases of internal derangement of the knee joint.

The medical man is well acquainted with the signs of the well marked lesion of displaced semi-lunar

cartilage, and is quite capable of effecting its reduction, but there is another frequent cause of disability in the knee joint which is not so generally recognized. The history in this class of case tells of some sprain of the joint, followed perhaps by a mild attack of synovitis, during which no apparent signs of displaced cartilage are to be detected. Gradually the swelling in the joint subsides and the patient is able to get about, but it is found that full extension of the limb is not quite perfect, and though pain is not a marked symptom, yet any attempt to brace the knee back in complete extension is rendered futile, not only by the discomfort produced in the front of the joint but by a sense of something checking the full action at the same situation. This slight but common form of locking has been attributed to a fringe or hypertrophied portion of the synovial membrane becoming nipped, either at the time of the injury or as a result of the semi-flexed position assumed by a knee joint in acute synovitis, allowing the hypertrophied fringe to protrude; this fringe, as the swelling subsides in the gradually straightening joint, may get caught between the condyles. The treatment is practically the same as that employed for the reduction of a displaced semi-lunar cartilage, flexing the knee fully and exerting firm pressure with the thumbs on the painful spot, and then, with a slight lateral movement, sharply straightening the leg.

Wrist Joint

Regarding the various accidents that may render this joint partially useless, ordinary sprains of the wrist are often delayed in recovery by the presence of some small adhesions or some inspissated synovial fluid in a tendon, causing pain on certain movements, even if no appreciable loss of movement is apparent. Again, the amount of rest on a splint necessary for the healing of a fracture in the neighbourhood, such as a Colles' fracture, may be sufficient to allow the carpal bones to be similarly incapacitated, and the movements of flexion and extension will be found defective, even when massage has been employed from the earliest date.

The actions of supination and pronation of the hand are likewise often faulty. In these circumstances it is advisable, if further massage does not give relief within a few days, to expedite recovery by manipulation. To loosen the wrist, the lower end of the forearm should be grasped in one hand and the carpus and metacarpus grasped in the other. Provided extension is the more defective movement, manipulation should be briskly done in the direction of flexion to commence with, then extension till the joint works freely. Grasping the hand in the same action as the ordinary hand-shake, with the forearm still held by the other, short, rapid movements should now be made laterally, followed by rotatory movements and the actions of pronation

and supination. If, from similar cause, the digital articulations are rigid, the affected finger should be grasped between the fingers of one hand, while the thumb and two first fingers of the other flex and extend the joint.

Where the whole hand is stiff from the too prolonged use of a splint, the articulations of metacarpal bones are commonly impeded by adhesions; they should be grasped at the digital articulation between the finger and thumb of one hand, the other hand seizing the second metacarpal in like manner. The bones are then briskly flexed and extended in opposition to each other; that is to say, whilst the first bone is extended the second is flexed, and *vice versa*. The remainder must be dealt with in like manner until the mobility is established. The whole hand should then be crumpled up in the action of clenching the fist and firmly squeezed.

The Ankle Joint

Any severe injury in the neighbourhood of the ankle joint which necessitates prolonged immobility is frequently followed by the formation of adhesions, either in the joint itself or amongst the tendons; though a certain amount of movement is usually possible, in the majority of cases any attempt to use it in a normal manner, or obtain a greater range of movement, gives rise to

considerable pain. Walking is only accomplished by keeping the ankle rigid and everting the foot instead of the ordinary toe and heel method of progression. Flexion is the movement most commonly found to be at fault, since in most cases of a fracture in that region the foot is kept at right angles to the leg. Again, though the flexion and extension may be perfectly normal, the movements of eversion and inversion are often found defective and painful from the presence of adhesions in the tendons passing round the malleoli. In such conditions recovery can be obtained by manipulating the joint under anæsthesia.

The foot should be seized by the operator's right hand, while the left takes a firm hold just above the joint, and short, quick, rocking movements made in the direction of extension and flexion. As mobility increases the knee should be flexed to relax the tendo-achillis, and greater force applied as each movement of extension is made. When extension of the foot has become fairly free, flexion should be made by the same method, only that the increasing force is applied in the direction of flexion. The foot should now be briskly inverted and everted, and then made to describe circles from within outwards and without inwards.

Where these movements are advisable it may happen that the whole foot is rigid from disuse, and it will be as well to follow the description of

the manipulations already given for loosening the stiff digital and metacarpal joints. Mr. Willett and Mr. Tubby have described the good results that can be obtained by manipulating certain severe types of flat foot.

Similarly, the bonesetter very often gives complete relief, by means of his movements, to those cases of continued lameness of the foot which persist long after all active signs of some apparently trivial sprain of the sole of the foot have passed away. In these conditions the pain complained of is vague and persistent, closely resembling that of pes valgus in regard to its situation and character, but though the gait in walking would suggest that the arch of the foot had dropped, examination fails to detect it. It is often assumed that the case, however, is one of incipient flat foot, for the relief of which *faute de mieux* treatment is usually prescribed. The patient, however, finds little or no relief from the various pads and alterations to the boot, in fact the pain is not infrequently accentuated. Careful enquiry and examination will usually trace the pain to one of the tarso-metatarsal bones, most commonly the first, which, on examination, will be found with its mobility either defective or lost, presumably through the presence of adhesions. In such cases I have found manipulations give the most satisfactory results, and am convinced that a large number of the

alleged flat foot cases cured by the London bone-setters are such as I have described.

Another form of foot lameness, in which manipulation often affords good results, is when pain is experienced in one of the metatarso phalangeal joints. The condition is very similar to the metatarsalgia described by Morton, but in the cases where this treatment proves useful, besides the pain felt on walking there is usually deficiency of mobility in the affected joint, as compared with the sound side, whilst the onset of the trouble can generally be traced to some such accident as treading on a stone when bare-footed or walking over cobblestones in thin-soled boots.

The Hip Joint

Perfect recovery from injury to the hip is often unduly delayed by the formation of adhesions, either in the capsule of the joint or the surrounding muscles. In such an accident as fracture of the neck of the femur the band of adhesions may be so joined as to cause almost complete loss of movement. Better results are obtained by cautious manipulations of this joint when crippled by rheumatoid arthritis than in any other similarly affected, provided there is still some degree of all the movements existent. It is possible that owing to the pain set up by the arthritic changes the muscles in control contract in order to protect the

joint from undue movement, and by so doing foster the formation of some fibrous adhesions which thus increase the existing disability.

The movement made under anæsthesia presumably ruptures these adhesions and stretches the muscles, and by so doing affords considerable relief. Improvement cannot, however, be maintained if the general condition responsible for the arthritic conditions be left unattended, and treatment in this direction should also be given. In those cases where the active state of infection has already stopped, the benefit gained by this treatment has often been remarkable. Again, the amount of destruction of the normal outlines of the joint, as seen radiographically, with the possibility of the range of movement being blocked by osteophytic formation, must be taken into consideration, and makes it difficult to promise that the relief will either be retained or permanently improved until the joint has been examined under an anæsthetic. Provided care is taken in the course of the operation no fear of doing harm need be felt, even if no good be afterwards experienced. It is as well, therefore, when proposing this treatment with regard to joints attacked by rheumatoid arthritis, to explain that it is not in the nature of a cure but merely with the object of affording temporary relief with the possibility of continued improvement.

Simple sprains of the joint, or that very common injury to the adductor muscles called rider's sprain, are not infrequently followed by considerable interference with the mobility of the limb, and though flexion and extension may be quite unimpaired, the actions of abduction and rotation outwards are limited and painful.

In the performance of the necessary manipulations for the more severe cases of ankylosis the hands should grasp the thigh close up to the joint, and by quick, circular movements obtain a certain degree of mobility, whilst the pelvis is fixed by an assistant. When the head of the bone is felt to be moving freely, the operator, in order to get better leverage, should slip his shoulder under the patient's knee, and, by alternately raising and lowering his body, obtain gradually increase of flexion, the hands in the meanwhile still continuing the circular movements of the limb. As soon as the thigh is flexed on the trunk the movements of abduction, adduction and rotation should be briskly performed. The thigh should then be extended, abduction again performed, and, where necessary, the contracted adductor muscles firmly kneaded. Finally, cross the leg over its fellow in the position of extreme adduction, and smartly rotate outwards. Should the thigh be fixed by adhesions in the position of flexion, the patient must be rolled on to the sound side and the thigh extended. In the less

serious cases the shoulder leverage will not be requisite, as the movements can be carried out by the grasp of the hands alone. Where, however, ankylosis is almost complete, such leverage will be found very useful, but care must be taken to previously loosen the joint by rotatory movements before attempting flexion, for fear of fracturing the neck of the femur. After treatment must be on the same lines as in other joints, with the object of restoring mobility and restoring the wasted muscles.

The Spine

The advisability of manipulating in cases of pain and stiffness of the spinal column requires careful consideration, and before undertaking the responsibility of doing so every precaution should be taken, by means of radiography and other means, to eliminate the possible presence of tubercular trouble. It is particularly in regard to their reckless interference in caries of the spine that makes the advice of the bonesetter so dangerous when sought in connection with stiff or painful backs. Judging from the description of patients, it is the custom of some bonesetters to manipulate and percuss the spine in practically every case, in addition to the treatment of any joint for which they have been consulted. This is apparently in accordance with the views of the osteopath, who, looking upon most ailments as being due to some

defect or displacement of one of the vertebræ, most commonly the seventh cervical, advocate routine manipulation of the spine. Apart from the methodical and daily manipulation of the spine in cases of scoliosis and kyphosis, as recommended by orthopœdic surgeons, the only conditions likely to be improved by forcible movement are where pain and stiffness have followed either an injury to or a rheumatic inflammation of the muscular structures. Falls on the head and shoulders, as in the hunting field, not infrequently leave behind painful rigidity in the muscles of the neck, which occasionally will obstinately resist the ordinary course of treatment, and here free movements under anæsthesia is often of the greatest assistance. The best way of accomplishing these movements is to take hold of the patient's head with both hands, one being placed under the chin and the other over the occipital region. Firmly but cautiously put the head through the actions of flexion and extension. These movements should now be followed by those of rotation and lateral rocking of the head, finally the muscles of the neck must be briskly kneaded. It is best that the first movements be in the direction of least resistance, that is to say, if, for example, rotation to the right is the more defective and painful motion, the first movement should be rotation to the left, and *vice versa*. The after treatment consists in massage and exercise as in

other cases. Pain and stiffness in the lumbar region, arising from injury, occasionally persist long after the immediate and acute condition has passed off. The history in these cases tells of some definite though frequently slight sprain of the back, necessitating perhaps but a few days' treatment for apparent recovery. Instead of perfect recovery the pain, though rarely severe, never quite disappears, and as time goes on it becomes more persistent. Good results can be obtained by treatment based on the assumption that the condition is due to some adhesions in the muscular or tendinous structure of those parts. On examination the lumbar muscles will be found wasted, whilst those on the affected side are usually rigid and contracted, and it may be assumed that it is here that some matting of muscles or adhesions among the deeper tendons exist. In this condition of what may be termed traumatic lumbago, treatment aims at stretching the contracted muscles and rupturing any possible adhesions. An anæsthetic having been given, the method employed is this, the leg on the sound side is flexed at the knee and the thigh flexed on the body till the knee touches the chest wall. It is then brought back to the extended position. The leg on the affected side is now put through the same movements and comparison can be made as to the difference in resistance. Both legs are now brought up together, and both knees should be kept

pressed against the chest for about a minute. The legs having been brought to the extended position once more, the patient is now raised to a sitting posture. The operator places one hand firmly on the affected side, whilst with the other he thrusts the patient back on to the couch, the hand in the middle of the back, acting as a fulcrum, causes extension of the part. By these movements full extension and flexion of the lumbar region is obtained. Pain rarely follows these manipulations, and greater freedom of movement is experienced almost immediately afterwards, but treatment by rubbing and exercise will be essential before recovery can be considered complete.

Another condition met with in this region in which manipulative treatment is often of great value is that of coccydynia. Kicks or falls on to the buttocks whilst in the sitting posture, though apparently of no great severity at the time of occurrence, are occasionally followed by considerable pain, which resists all the more usual remedies for its relief. In such a condition, prolonged sitting, or the act of defæcation, are sufficient to cause pain, and patients suffering in this way rarely sit on both buttocks simultaneously, but will shift their weight when sitting from one buttock to the other in their endeavours to avoid pressure in their coccygeal region. Some cases, indeed, have come under observation in which removal of the coccyx

has been recommended as a last resource, and have been entirely remedied by the subjoined method, but it must be admitted that in other cases of this condition, in which the history of trauma has been vague, no relief has been obtained. Treatment consists in freely moving the coccyx, and since in the majority of these cases the bones entering into its formation are found either defective on movement, or quite rigid, it may be assumed that adhesions are formed between or around their articulations. In addition, the coccyx may be found deflected to one side or the other. In order to carry out the proposed manipulations the patient, previously anæsthetized, should be turned on to the left side with knees drawn up. The operator then inserts his right forefinger into the rectum till the top of the coccyx can be felt, whilst the fingers of the left hand exert light pressure over the coccyx from without. The index fingers of both hands now rock the tip of the coccyx backwards and forwards, and gradually move up till the sacro-coccygeal joint is reached. Careful massage following this procedure is of the utmost importance, and, having been started within a few hours of the operation, must be persisted in daily till all pain has disappeared, which, in cases of long standing, may take three weeks or even longer to accomplish.

CHAPTER IV

EXERCISES IN AFTER TREATMENT

In addition to the employment of immediate massage, references have been made to the importance of suitable exercises in the after care of all cases treated by forcible manipulation. Of course their necessity, or the length of time for which they will have to be maintained, will depend on the amount of muscular wasting found, but in all these cases a certain degree will always be present, partially from disuse and partially from the reflex action of the original hurt. Galvanism and faradaism are methods commonly adopted to remedy ordinary cases of wasted muscles, especially when due to some definite nerve lesion. When, however, the wasting is due to the causes mentioned in the conditions under consideration, the stimulus received from the mind for the voluntary action of the muscles is preferable. These exercises should be performed by means of weights and pulleys, which offer graduated resistance to the muscles, as is the case with a Benson, Foot or similar machine, but a simple substitute for these can easily be arranged where, for some reason or other,

they cannot be employed. Dr. Wharton Hood, in his book, "Treatment of Injuries," gives the reason why he advocates this form of exercising in preference to any other, and in explanation says:—

"The residual incapacity, so to speak, which may be left behind by various injuries, will usually require for its removal the careful employment of muscular exercises, specially designed for the purposes which they are intended to fulfil; and that these exercises, generally speaking, cannot be replaced by others. A healthy person may unquestionably promote not only general muscular development, but also the development of particular sets of muscles, by almost any kind of activity, which calls either the whole or a part of the body into exertion; and for the purpose of what may be called general athleticism all manner of apparatus and all manner of schemes of exercise are already before the public, and may be employed to the taste or fancy of the employer, if not with identical, at least with comparable and fairly equal results. Clubs, dumb-bells, india-rubber bands, all have their uses, and their advocates; and many forms of exercise may be accomplished with them all. For the relief of partial disabilities or of the weakening of certain portions of muscles, as the result of an injury, it is not too much to say that they all conspicuously fail of attaining the objects for which they are supposed to be required. A

muscle which has suffered, let us say a laceration of a few of its fibres, and which in consequence of that laceration has been permitted to 'rest,' or in other words, to undergo wasting for some indefinite period of time, is left in a state of general debility, which is accentuated with reference to some particular direction of movement; that is to say, with regard to any in which the lacerated fibres, if sound, would be called upon to take a prominent part.

"Let it be assumed that the laceration has occurred to a few fibres of the deltoid, and that the arm has been kept in a passive condition. The power of raising it will be altogether impaired; but it will depend on the position of the lacerated fibres whether the impairment will be more conspicuous in direct raising, or in raising with an inclination backwards or forwards. Whichever it may be, the movement which occasions pain will not only be avoided, but, whenever circumstances call for any approach to it, the stronger portions of the muscle will be thrown on guard, so to speak, for the express purpose of protecting the weaker parts from being employed. If the patient be made to grasp a suitable ring or handle, to which is attached a cord running over a pulley fixed above the head and carrying a light weight, say of two pounds or so, at its other extremity, and is directed to draw up the weight as far as may be convenient, and then let it

return gently to its position, doing this again and again, a very different effect will be produced. If the patient commence with his arm raised as high as possible, its descent under the influence of its own gravity, or the mere cessation of the effort to keep it elevated will suffice to draw up the suspended weight; and as this sinks to return to its original position, the arm will again be almost unconsciously raised and the deltoid will be more and more brought into play and exercised, without any strain at which its specially weakened portion can take alarm. This specially weakened portion, indeed, will find itself at work before it is aware, and will be cheated, so to speak, into constantly increasing participation in the effort of the muscles as a whole. If the weight were a heavy one, or if an attempt were made to lift a dumb-bell or a club, no similar effect would be produced; and if the patient were directed to draw down the lower handle of an india-rubber band, this would offer a constantly increasing resistance to its new elongation and would tend, whenever the downward pull ceased to take the arm up with a jerk, to harass the deltoid instead of beguiling it. The principle thus laid down is of universal application in such cases, and a few days will generally suffice to bring the specially weakened portions of the muscle into line with the remainder, and to get rid of any pain which the earlier efforts may have caused. When this has been accomplished the muscle may

be exercised more freely, and as a whole, and the weights employed may be increased. All that is necessary in the first instance is so to arrange the exercises as to furnish a movement in which the weakest part of the affected muscle must take its share, and to do this in such manner that the movement in question is started and in its course is facilitated by the descent of the weight which the opposite action has drawn up."

Dr. Wharton Hood then goes on to discuss these principles as applied to the muscles of the leg:—

"The first exercises should be made by attaching to the ankle a band, from the inner side of which, at the level of the malleolus, a cord passes under a pulley a little above the level of the floor, ascends some five or six feet, passes over another pulley, and then descends, carrying an appropriate weight. The patient being seated, and the cord taut, he makes a movement of abduction of the leg, drawing the weight up as he does so, and when he has accomplished what he can in this direction, he allows the action to be reversed, and is assisted to assume a position of adduction by the weight as it descends. In this way the adductor muscles are gently stimulated into renewed activity, the natural range of movement is soon restored, and is accomplished without the pain which previously attended all efforts in this direction. The exercise may soon be varied and the weight increased, as strength is gained,

and at the discretion of the surgeon; and as soon as the thigh is restored to the same measurement as its fellow the cure may be regarded as complete.

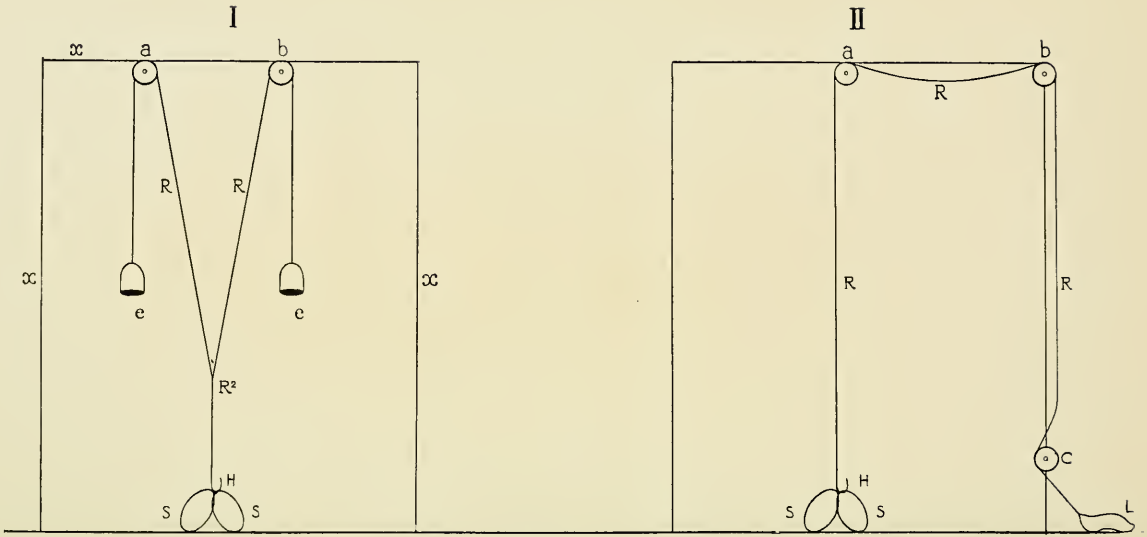
"It is manifest that by means of an ankle band or stirrup, to which a cord is attached, and by the combination of two or three pulleys, every possible movement of the lower extremities may be performed against the pull of the weight, and reversed with assistance from it as it descends; and that the exercises may be accomplished in either a sitting or a standing posture. The surgeon has first to consider what movement it is that the patient is least able to perform, and to arrange the contrivance in such a manner that this movement shall be assisted by the weight as it returns to the position from which it has been raised by the antagonistic movement. The same applies to all muscles of the arms and trunk (handles being substituted for the anklets) with the exception of flexion and extension of the hands by the muscles of the forearm. For these, the best contrivance is a roller of such diameter that the fingers will close round it comfortably, fixed at a convenient height and furnished at one end with a ratchet that can be released, and at the other with a cord carrying a weight, and so arranged as to coil round the roller as it is turned. The roller should then be grasped overhand for the exercise of the flexers, and underhand for the exercise of the extensors, and slowly turned until the weight is

completely wound up, when the ratchet may be released and the weight either suffered to run down or controlled in its descent by muscular effort."

In addition to the employment of exercising on these lines, great advantage can be obtained by prescribing swimming, especially in cases of the back and hip joint. "The water buoys up the affected limb, and renders its movements comparatively easy."

There are several machines on the market working on the principles Dr. Hood describes, which are sold with a chart of the different exercises for each limb. The medical man, at the commencement, should attend the first few performances with the object of selecting the most suitable movements and regulating the amount of weight to be used. At the start it will be found advisable to begin with a light weight and a small number of each individual movement. As the muscles improve in strength and agility, the number of movements may be increased, but no increase should be made in the weight till at least a week has elapsed. In addition to the performance of these exercises, patients with marked disability may be instructed to persevere in certain motions which will help the restoration of mobility by the voluntary stretching of their muscles. In the case of a shoulder the patient should stand facing a door, placing both hands on it he has gradually to

creep up higher by the purchase obtained by his fingers. This should be done daily till the injured limb can reach as high up the door as its fellow. When this can be accomplished with ease, he may seize the top of the door with the hand of the unsound arm, and by the gradual bending of the knees regulate the stretching of his muscles. Where a knee is stiff, the patient, facing the wall, should place the foot of the injured side touching and at right angles to the wainscoting. Then, with the sound leg regulating the amount of strain, strive to make the injured knee touch the wall. As soon as this can be done the foot may be withdrawn a few inches from the wall, and further efforts made to touch the wall with the bending knee. The movement is practically the same action as "the lunge" in fencing, and it is essential that the sole and heel of the affected limb be kept flat on the ground in its performance, as the lifting of the heel masks the bending of the knee. Where the actions of supination and pronation are defective in an elbow or wrist, a can of water is seized by the handle and efforts made to twist it first to the right and then to the left. The momentum of the swinging can accentuates the voluntary action of the muscles and helps to stretch those opposed to the movement. Some variations and additions will doubtless occur to medical men when dealing with cases where some voluntary stretching is



Diagram

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desirable, but in which the above movements are not quite suitable.

Where the erection of one of the manufactured machines is impossible, or where the amount of existing disability needs but a short period of exercising, an efficient apparatus can easily be rigged up by means of some pulleys, a few yards of rope, and two sand bags with loops attached. The method of erection can be best explained by the subjoined diagrams.

(1). Arm work. a b = pulleys, distance apart equal to width of patient's shoulders: X = architrave of doorway, the frame of the machine: R = ropes joined at R^2, threaded through pulleys a b; H = hook on which to hang sandbags: S = sandbags of 1½lbs. each: E = handles.

(2). Leg work. a b c = pulleys: R = rope threaded through pulleys terminating in the anklet to be fixed to the foot: L = anklet or loop for foot: S = sandbags 2½lbs. each.

The object of having two sandbags is that in some exercises a very much lighter weight will be found necessary than in others, and the removal or addition of a second bag renders this easy to manage.

The weight suggested is about the average required at the commencement of an ordinary case, but the medical attendant must judge for himself the desirability of either increasing or lessening the

amount. A certain amount of care in the adjustment will be necessary to ensure the smooth running of the ropes through the pulleys, but this simple contrivance does admirably as a substitute for the more expensive machines, and will cost but a few shillings.

CHAPTER V

NOTES ON CASES

In the selection of cases which illustrate the treatment of the various conditions described in the foregoing pages, a choice has been made of those where the disability complained of was not very marked. The majority had not only been under competent medical attention at the time of the original hurt, but had usually run through the gamut of massage, radiant heat, and ionization in their search for soundness. These slightly impaired joints are typical of the cases that throng the modern bonesetter's consulting room, and it is for this reason that they are given in preference to the more marked cases of ankylosis. Generally speaking, when after a reasonable time has elapsed, a patient fails to regain complete freedom of action and pain in an injured limb, medical men would do well to assist recovery by treatment based on these lines, instead of trusting to the further continuance of the more usual remedies. Granted that time and patience in a large number of cases may bring restoration to the normal, still this treatment undoubtedly expedites recovery, and would probably satisfy the patient

and his friends that the advice of a bonesetter was not required. Amongst the following cases will be found examples of what can be done where impairment has been due to injury of the soft parts by bullets. The very successful issue in each of the three cases treated in this way may possibly be of assistance to those who, at this time, are engaged in looking after our convalescent soldiers.

A. C. Male, ætat 62. Traumatic Lumbago.

Six months ago, playing golf, sprained the back when driving. Pain became so acute he returned home. Belladonna plaster was applied. The acute pain passed off in the course of a few days, but had noticed a certain amount of discomfort ever since. Recently has been out shooting, and the walking has caused the pain to return. Treatment has been given for rheumatism and lumbago, medicinally and locally. Lumbar muscles on the right side crampy and stiff. Difficulty in bending down to lace boots. Operated upon, lumbar muscles stretched, followed by rubbing one week, exercises fourteen days. Discharged cured.

Mrs. L. Adhesions shoulder.

Two months ago fell over a strand of wire on to left shoulder. Very painful. Impacted fracture head of humerus seen under radiograph. Was kept absolutely quiet for three weeks and then massage. Shoulder is now stiff and painful. Rotation defective, abduction defective. Thickening round the capsule of the joint. Operated on. Rubbed for ten days. Exercises

commenced and rubbing continued. Three weeks later thickening nearly all gone, still slightly painful at the anterior aspect of the joint and in the upper part of the coracobrachialis. Rubbing for another week and to exercise at home. Received letter week later practically sound.

Mrs. G. W. Ankle-joint Adhesions.

Three years ago fractured both bones of the left ankle. Again fell, refractured a year later. Splints and rest for seven weeks. Massage was commenced fairly early and continued for eight weeks. Still complains great pain on walking, and has never felt sound on the foot. Rest has been prescribed and tried on several occasions with no result. Movements of the foot on careful examination were found to be slightly defective, both in extension and flexion, on comparison with the uninjured limb. Was operated on, rubbing for ten days. Discharged perfectly sound and has remained so.

R. H. Elbow-joint Adhesions.

Fell into a trench four months ago when training, injuring right elbow. Radiograph shows slight injury condyle of the humerus. Massage was tried and got better. Then was ordered to France. When there found he was unable to use arm without great pain, so returned home for advice. Still complains of joint being weak and painful. Extension defective, supination almost entirely lost. Biceps very contracted. Operated upon. Massage and exercises. Returned to the front perfectly sound within fourteen days of the operation.

Miss M. B. Adhesions tarso-metatarsal joint.

Seven weeks ago sprained right ankle. Saw her medical attendant, who strapped the joint, and she was able to potter about. Five weeks later, though all swelling had disappeared, pain continued in the front of the foot. Consulted well known orthopœdic authority, who ordered pad and alteration to the boot. A radiograph which was taken was negative. Pain is still present on movement, and she still walks lame. Mobility of the tarso-metatarsal joints defective. Operation followed by massage. Perfectly sound within two weeks and has remained so.

K. I. Female. Contracted Muscles.

A year ago, skating, sprained inner side of the right thigh high up. Elastic bandage applied and rest enjoined. Complains of great weakness in the thigh and pain on use. The adductor tendons found to be crampy and contracted. Abduction painful and limited. Muscles stretched under anæsthetic. Rubbing and exercises. Received a letter in a month's time absolutely sound.

H. B. Male. Contracted Muscles.

Hacking two years ago sprained inside of the right thigh. Laid up for fourteen days with home treatment of rubbing in liniment. Abstained from riding that year. Hunting the following year the thigh went again. Rested for two months. Went out hunting again, and the thigh went again. Six weeks later tried riding, thigh went again. Has been wearing a Salmon's riding belt with no relief. Adductor muscles found wasted and crampy. Abduction painful and limited. Operated upon. Massage

and exercises. This patient has hunted regularly without further trouble for the past five years.

S. B. Male. Hip-joint Adhesions.

Two months ago walking slipped off the curb. Something went in the left hip-joint, not badly, but it was very painful for a few minutes. He took no notice, but continued to use it freely. Two weeks later walking over rough ground out fishing, became much worse. Treatment has been spasmodic resting, but the condition is worse than ever. Radiograph shows early arthritis. All movements of the hip are imperfect, distinctly painful spot in the centre of the groin over the ilio femoral band. Operated upon. Massage and exercises. Month later perfectly sound and has remained so.

P. C. Male. Traumatic Lumbago.

Four months ago horse fell backwards on him. Right side of the back being severely bruised. Rested off and on, and acute condition soon passed away. Pain still present on certain movements, greatly accentuated by any violent exercise, such as tennis or riding a rough horse. Has been advised to rest for six months. Muscles in the right lumbar region contracted and tender. Movement of bending and rocking to the left defective. Operated upon. Massage, exercises, swimming. Perfectly sound within three weeks.

R. D. M. Male. Belgian. Elbow-joint Adhesions.

Shot through the fore arm and upper arm in early October. Fracture of the radius. Treated in hospital

abroad and in England till wound healed. Has been discharged by the Belgian authorities from hospital as a réformé soldier. Inability to extend or flex elbow joint without great pain. Supination and flexion defective. Operated. Massage and rubbing. Discharged cured, after three weeks.

A. B. Belgian. Ankle-joint Adhesions.

Shot through the right ankle joint middle of October. Treated in hospital abroad and in England. Discharged by Belgian authorities as a réformé soldier. Wishes to go to Spain to take up post of chauffeur. Is still on crutches. Unable to extend foot without severe pain or bear least weight on it. Bullet wound still unhealed, having had no medical attention for fourteen days. Foot flexed and rigid. Treated bullet wound by dry dressings and bandage. Healed at the end of a fortnight. Week later operated under an anæsthetic. Freely moved the foot and ankle. Followed by massage. At the end of three weeks was able to walk freely and painlessly with perfect movement of joint without any support. Has left England.

T. J. Hip-joint Adhesions.

Six months ago, in Belgium, received a bullet wound through the left buttock; exit in the left groin; the bullet passed through the right testicle and embedded itself in the right thigh. Right testicle removed by operation and bullet extracted from thigh.

Wounds were healed five months later, and patient was discharged from hospital. Unable to walk without intense pain in the left thigh and groin. Movement very

defective in the hip joint; flexion markedly so; abduction and rotation slightly. Has been discharged by the Belgian authorities as a réformé soldier. Manipulated, and massage prescribed. Five days later walked to my house, a distance of four miles, free from pain. Movement greatly improved. Exercises ordered. Seen week later, is now practically sound.

A. G. Hip joint.

Slipped and fell nine months ago on to left hip, which was severely bruised. Kept quiet with local applications of hot stoups. Since then has never been free of pain, which occasionally runs down the thigh. Complains also of a sensation of stiffness in the joint. Has received massage and heat. The patient is a stout man with an alcoholic tendency. Abduction, flexion, extension, and rotation limited and slightly painful, increasing if movement is persevered with. Was operated upon, massage and exercises. Good result.

A. W. Nipped Membrane and Adhesions.

Six weeks ago fell at tennis, slightly spraining the right knee, but continued playing for two hours. The knee then became very painful and swollen. Saw his medical man. Rest prescribed, local application of ice. Next day hot water fomentations were ordered and continued for ten days. Still unable to get about without discomfort in the joint. On examination slight synovial thickening detected. Full extension of the joint imperfect, and pain on pressure over inner condyle. Muscles wasted 1½ inches. Diagnosis, nipped membrane and

adhesions round the internal lateral ligament. Operated upon; rubbing and exercises for three weeks. Perfectly sound.

R. H. Adhesions in Finger.

Five months ago twisted the right forefinger in a door. Severe pain. Saw his medical man. Splints were ordered and ointment rubbed in. Fortnight later saw surgeon in consultation. Massage and radiant heat prescribed. After a week or so treatment was stopped, and he went abroad. Became rapidly worse, and at Monte Carlo saw medical man, who prescribed Bengué's anesthol. Consulted another medical man, who ordered supphaqua baths. Index finger middle joint rigid, shiny, painful. Slight rocking movement. Operated on. Massage for two weeks and roller exercises. End of month perfectly sound.

Mrs. N. Elderly Lady with Rheumatic History. Adhesions Wrist Joint.

About six months ago right wrist became painful to use. Saw her medical attendant and was ordered to Droitwich. Massage prescribed, but the pain was increased. Radiant heat and ionization also tried without effect. Radiograph negative. Slight interference with normal action of wrist and pain over external lateral ligament, with thickening round the tendon sheaths. Manipulated under an anæsthetic and rubbing ordered. When last seen had lost all pain in the wrist.

Miss H. Metatarsalgia due to Adhesions.

Eight months ago pain in right foot. Saw doctor, who ordered rest for a fortnight. Then massage was prescribed,

and after pottering about for five weeks went to Smedleys, where improvement took place. Three months ago the foot became worse. Diagnosis of "flat-foot" was made and boots altered for correction. Further treatment at Llandridod with no benefit. Still very lame. Pain most marked over third metatarso-phalangeal joint, which is thickened and stiff. Foot manipulated, treated by massage and strapping the front of the foot. Got quite well, wearing normal boots.

Miss P. Hip joint.

Two years ago, whilst doing physical culture exercises, sudden pain in right hip joint. In the course of a few days consulted her medical man. Electrical treatment and medicine prescribed for sciatica. Pain still continues on exercise. On examination the following movements were found defective and painful, flexion, external rotation, and abduction. Radiograph was negative. Hip joint manipulated under ether. Freedom from pain noticed immediately afterwards. Rubbing and exercises soon established permanent soundness.

Miss E. Shoulder joint.

Sprained right shoulder six months ago lifting window, no treatment, but spared the arm for a few days. Pain has never entirely gone, and the last few weeks has been getting worse and wakes her at night. Inability to place hand behind back. Abduction also defective. During manipulation adhesions felt to yield during rotation. Rubbing and exercises completed the cure.

Miss D. Coccygodynia.

Four months ago noticed pain in coccygeal region after riding a bicycle. Pain noticed to come on after and whilst sitting. Pain at stool only felt when constipated. Has been getting much worse and now complains of pain in lumbar muscles as well. Radiograph negative. Has been receiving treatment, hot fomentations, and latterly morphine suppositories. Under ether the coccyx was found stiff. Free movement was given and afterwards massage. Coccygeal pain rapidly decreased, but the pain in the lumbar region remained. Exercises ordered. A letter received two months later asks for permission to play tennis, saying, "My back is now very much better, and I have little or no pain."

Mr. C. Shoulder joint.

Threw a stone four months ago, acute pain in right shoulder lasting but a few minutes. Has never quite recovered since. attempts to use shoulder freely bring on the pain. Has tried rest, massage, and medicinal treatment for rheumatism. Joint moved under ether, rubbing and exercises ordered. Returned home at the end of ten days and got speedily sound.

Major B. Wrist.

Three months ago back fire starting car, sustained fracture left radius with slight displacement. Splints one month, since then home treatment of rubbing and use. Still stiff and painful. Supination and pronation defective. Moved under ether, movements rapidly became freer and less painful. Patient discontinued treatment early, and after history is not known.

Mr. P. Flat foot, so-called.

Acute rheumatism two years ago affecting both feet. Never been able to walk without pain since. Under general rheumatic treatment has improved, but feet remain painful on use. Has received radiant heat and has been wearing valgus pads on both boots. Feet rigid and move *en bloc* from ankle joint. Free movement under an anæsthetic, and rubbing ordered. Mobility at once restored, and within two days patient was able to walk for some hours before onset of discomfort or pain. Feet were strapped, whilst the inner side of the boots was being slightly raised and pads removed. Can now walk freely and comfortably.

1. Hand Grasp for Lateral and Circumductory Movements of Wrist.

2. Hold for Flexion and Extension of Wrist.

3. Hold at Completion of Flexion of Elbow Joint and Preparatory to Extension.

4 Hold during Extension of Elbow—Note Thumb Pressure over Head of Radius.

5. Rotation of Head of Humerus with Right Hand, Left Hand holding the Joint.

6. Hand slid up for Short Lever, bringing Arm across the Chest.

7. Right Hand pushing against Scapula during Abduction of Arm.

8. "Arm having been Rotated Outwards, is now brought up above Level of Head.

9. Placing Arm behind the Back—Note Left Thumb pressed over Head of Biceps.

10. Grasp of Hands for Knee Joint, Patient's Foot between Operator's Thighs.

11. Flexion of Knee Joint by Bending of Operator's Knees.

12. Flexion of Hip Joint in Traumatic Lumbago—Left Hand steadying the Pelvis.

13. Both Thighs Flexed and pushed on to Chest Wall.

14. Completion of Thrust Back for Extension of Spine by the Right Hand—The Left Hand pressing acting as the Fulcrum.

15. Grip of the Foot in Tarso-Metatarsal Adhesions—Note Position of Right Thumb.

16. Position of Patient in Posture Exercises for Voluntary Stretching of Shoulder.

17. First Position of Posture Exercise for Bending Knee Joint.

18. Second Position.

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